Stories of Hope: Diabetes

Maybe it was the candy, **Joelle Johnson** thought when the doctor explained her blood test results. She just ate too many sweets, she reasoned. That's why her blood sugar was so high.

She couldn't have diabetes. She was certain. "To tell you that my diagnosis caught me off guard would be a massive understatement. I went to the doctor for yeast infection," she said. "I left the office in tears. I didn't care what the blood test said. I refused to believe it."

That was four years ago. Today 30-year old Johnson, who works in marketing for Walt Disney, injects insulin into her belly five times a day. She reads labels. She calculates what she eats so she can treat herself to the occasional Big Mac.

- Watch the Spotlight on Diabetes talks
- Read about CIRM funding for diabetes research

Curing Diabetes

In type 1 diabetes, the body's immune system makes a devastating mistake. It decides that insulin-producing cells in the pancreas are the enemy and kills them.

That's why people with what was once called juvenile diabetes need to inject insulin two, four, five times a day. Without insulin, the liver doesn't know when to stop releasing glucose nor can the body get rid of it. Glucose floods the bloodstream, damaging tissues and leading to blindness, kidney failure, heart disease and death.

Emmanuel Baetge, PhD, vice president and chief scientific officer for Novocell Inc., says the San Diego-based company is on target to undo the work of this friendly fire by not only replacing missing insulin-pumping islets of Langerhans cells, but by protecting the new cells from further attack. This year, Novocell became the first commercial enterprise to receive funding from CIRM.\

The work could be transformational, said Peter Butler, MD, director of the Larry Hillblom Islet Research Center at the University of California, Los Angeles.

"It's going to be one of the greatest accomplishments in medicine," Butler said. Only the discovery of insulin in the 1920s, which changed what was once a rapidly fatal disease into a chronic condition, compares.

Baetge said researchers first coax embryonic stem cells down the same developmental path they would have followed in the body. The stem cells first transform into relatively undifferentiated endoderm, then evolve into cells like those found in the developing gut and finally transform into the buds that will grow the six-inch-long pancreas.

These bud cells are the goal. Researchers implant them into mice, either under the skin or in fat pads, where they mature into insulin-squirting islet cells. When researchers experimentally destroy the animal's insulin-making cells, the human islet cells maintained stable blood glucose and insulin levels.

To protect the islet cells from attack, the company proposes coating them in polyethylene glycol, a gel-like substance that is impermeable to attacking immune cells but still allows the islet cells to interact with the blood. The company is also looking at other ways of isolating the new beta cells from immune attack as it begins studies in large animals. Baetge says human trials may begin in 2012.
